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Notes on Phoradendron flavescens, Nutt. II.

BY J. SCHNECK.

The northern limit of this species, so far as I can ascertain, is near 40° N. lat., except near the Atlantic and Pacific coasts. Gray[1] and Wood[2] both give its habitat as New Jersey to Illinois. and southward. Wm. M. Canby[3] reports it as "frequent" on the peninsula between Delaware and Chesapeake Bay. Lester F. Ward[4] reports it from the vicinity of Washington, D. C.; John M. Coulter and C. R. Barnes[5] for the State of Indiana, as "common south." H. N. Patterson[6] reports it from Wabash and Jackson counties, in Illinois. The most northern station given in the Pacific R. R. Rep., is Benicia, California. It is not mentioned in Bot. King's Exped.; while in Bot. Wheeler's Surv. W. of 100th meridian var. *villosum* is reported from Oregon. Mr. W. M. Canby writes me that he has observed it between Trenton and New Brunswick, N. J. These last two are the only stations of which I have any knowledge north of 40° N. lat. Mt. Carmel, Ill., is near 38° 30′ N. lat., with a range of temperature from +104° to —26° Fahr. When we have several consecutive mild winters the mistletoe becomes common, but is again almost exterminated by the return of continuous cold weather, in which the thermometer remains at or below zero for a number of consecutive days. The winters of 1878–79 and 1880–81 were remarkable for the great number of continuous cold days, and came near extermina ting the species from our flora. The two following winters were comparatively mild, and as a result the mistletoe was quite abundant last fall. But the unusually severe January we have just passed through has killed most of the bunches.

Does the mistletoe injure the host upon which it grows? My

[1]Manual, 1868. [2]Class-Book, 1860. [3]Bot. Gaz. 6. 271. [4]Flora of Washington and vicinity. [5]Cat. of Indiana Plants. [6]Cat. of Illinois Plants.

observations lead me to answer this question in the affirmative, but in a limited degree. When a thrifty bunch infests a limb, the distal extremity soon ceases to grow and finally dies, unless it be a very large limb; but the tree itself seems to be little, if at all, affected in its growth.

The host on which this parasite is found is peculiar in some localities. During the past eighteen months I have observed it on the trees in this vicinity, as follows: *Acer dasycarpum*, on 6 trees; *A. saccharinum*, 5 trees; *Ulmus fulva*, 1; *Quercus palustris*, 1; *Gleditschia triacanthos*, 28; *Ulmus Americana*, many thousand. In the lower portion of Delaware it is reported as having been found only on *Nyssa multiflora* and *Acer rubrum*[7]; in the vicinity of Washington as "exclusively on *Nyssa multiflora*[8]." The American Elm is not a rare tree in either of these localities, while on the other hand the Black Gum is a common tree in this vicinity, and I have never found a single bunch of mistletoe upon it. I have observed the Elm and Black Gum interlock branches, the former bearing mistletoe and the latter not. In this vicinity it is generally found on trees that grow along streams and on bottom lands, and is rarely seen on the uplands. I made the following notes from the car windows on a visit to Washington, D. C., in February, 1883, starting from Mt. Carmel, Ill., and traveling via Louisville, Ky. "Abundant, but only on the American Elm, until we came to Winslow, Ind. Here for the first time I observed it on the Black Gum. From this on I found it on this species as often as on the Elm. In the blue-grass region of Kentucky I found it common on the Black Walnut and Wild Cherry. In West Virginia it was common on the Red Maple, but had disappeared from the walnut and cherry. East of the Blue Ridge I observed it on a Beech."

Prof. John Collett[9] gives the following list of trees on which he has observed it in Vanderburg county, Indiana, and the relative frequency of its occurrence on them for 1,000 trees: Black Gum, 500; Red Elm, 420; Water Birch, 20; Black Walnut, 15; Honey Locust, 10; Blue Ash, 10; Soft Maple, 10; Hackberry, 5; Yellow Willow, 5; Shell-bark Hickory, 2; Spanish Oak, 1; White Oak, 1; Wild Cherry, 1. In addition to the above I find records of its growth as follows: Prof. J. M. Coulter[10] reports it as occurring on the Elm and Black Walnut, near Louisville, Ky., and on the "Elm, Walnut, Honey Locust and various other trees," in the vicinity of Hanover, Ind. A. H. Curtiss[11] says "it

[7]Bot. Gaz. 6. 271. [8]Flora of Washington and vicinity. [9]Ind. Geol. Surv. 1875, p. 241. [10]Bot. Gaz. 2. 116. [11]Bot. Gaz. 3. 36.

abounds in Florida, where it may be found on nearly every kind of tree. We know of one plant growing on a low *Prunus Chicasa* only eight feet from the ground." Dr. J. S. Newberry[12] reports var. *pubescens* as being found on *Æsculus Californica*, at Benicia, California. Dr. J. Torrey[13] states that var. *orbiculatum* was found on *Quercus Emoryi*, in New Mexico, and var. *pubescens* on *Q. agrifolia* in Southern California. In Bot. Mex. Bound. he reports var. *glabriusculum* as being found on *Algarobia glandulosa* along the Rio Grande. Dr. George Engelmann[14] says of var. *macrophyllum* that it was found on soft woods, the Ash, Willow, Poplar, Sycamore and Sapindus, along the Gila and Bonita rivers; and of var. *villosum*, that it was found on hard woods, principally Oaks, in Oregon, California and Arizona, and in the mountains of Arizona on *Q. undulata*. I am informed by perfectly reliable authority that it is common on the Persimmon in the southernmost counties of Illinois. L. F. Ward informs me he has observed it on *Acer rubrum* in the Dismal Swamp.

Notes on the Flora of W. Dakota and E. Montana Adjacent to the Northern Pacific Railroad.* I.

BY JOHN B. LEIBERG.

While in the service of the Northern Pacific Railroad Company during the past year in the interest of tree culture, I had abundant opportunity to examine the interesting and, to some extent, peculiar flora of Western Dakota, and to a limited degree the eastern portion also, and the eastern part of Montana as far west as the Yellowstone river at Glendive, and to make large and full collections of the same. Copious and interesting notes were made respecting the botanical features of the region, and a few of the more prominent are here presented.

The climate of Eastern Dakota, in both rain-fall and temperature, does not appear to present any great variation from that of the prairie region of Western Minnesota, except, perhaps, a somewhat longer winter. The climate of the western portion is very different. The summer is very dry; showers are of rare occurrence, and the temperature varies excessively. Thus in the month of July the mercury rose to 115° Fahrenheit, and fell to 32°.

[12]Pacif. R. R. Rep. [13]Pacif. R. R. Rep. [14]Bot. Wheeler's Expd. 252.

*Read before the Minnesota Academy of Natural Sciences, March 4, 1884.

Such great variations can not fail to modify plant life to a very great extent. The hot, scorching winds that generally accompany the high temperatures quickly dry up all vegetation, except along the water-courses. The extreme dryness of these hot winds is remarkable. During the great heat which prevailed in the early part of July, I saw the grass on the prairie, which was green and fresh as prairie grass usually is, completely dried up and converted into hay within a period of two hours. As a consequence of this dry weather, we find no annuals in summer. They only appear during the spring while the ground is still moist. The perennials all have long root-stocks, which penetrate deeply into the ground and enable them to withstand the drouth effectually.

The surface of the country west of the Red river valley is more rolling than in Minnesota, and is found still more so as the Missouri river is approached. Numerous stony knolls and long ranges of rocky, pointed hills mark the ancient glacial moraines. The flora here shows plain indications of the proximity of the dry, treeless plains west of the Missouri, though at the same time the climate is humid enough to permit species of plants to grow and flourish, whose principal habitat is much farther eastward. Here and there alkaline pools appear with their peculiar plants, adding largely to the variety of the flora of this region. Many species are found whose home in the southwest is at a high elevation, proving that as we go north the increase in latitude compensates for a decrease in elevation.

Scattered over the drift hills in great abundance, and the first flower to appear in spring, is *Anemone patens*, L., var. *Nuttaliana*, Gray, attaining a luxuriance of growth never met with in Minnesota. After crossing the Missouri and the western boundary of the glacial drift, this plant wholly disappears. In the moist places of the prairies is found *Ranunculus glaberrimus*, Hook., and around alkaline ponds *R. Cymbalaria*, Pursh, the latter being very abundant west of the Missouri river. Another representative of this genus resembles *R. rhomboideus*, Goldie, but differs from that in its more erect and taller growth and much smaller flowers. It appears to be some undescribed species.

A *Draba*, probably *D. nemorosa*, L., is quite plentiful. Early in the spring, and flowering until late in the summer, we find *Vesicaria Ludoviciana*, DC. *Erysimum asperum*, DC., var. *Arkansanum*, Nutt., is abundant as we proceed westward, becoming a very conspicuous plant. Around the alkaline ponds grows a *Nasturtium*, near *N. sinuatum*, Nutt. It may prove to be only a variety of this species.

Cleome integrifolia, Torr. & Gr., which is found here and there in Minnesota as an introduced plant, is first met with in its indigenous state in Pyramid Park, near the Little Missouri river. There also, and nowhere else in the territory under consideration, *Cleome lutea*, Hook., was observed. *Polanisia graveolens*, Raf., was frequently noticed along the water-courses, differing somewhat from its character in Minnesota, in having a more clammy pubescence and longer and more turgid pods.

Viola Nuttallii, Pursh, was met with abundantly, but does not extend to any great distance west of the Missouri river, and was not observed east of Jamestown. *Viola cucullata*, Ait., was not rare in the region covered by the drift, but was confined to the borders of the numerous small ponds.

A *Cerastium* and two species of *Arenaria*, not determined, were very common. One of the Arenarias was met with only on the top of the buttes west of the Missouri, forming dense tufts, the short stems closely covered with small rigid leaves, giving it a spiny appearance.

A rather common and showy plant was *Malvastrum coccineum*, Gray, the only one of the *Malvaceæ* seen.

Two species of *Linum*, *L. rigidum*, Pursh, and *L. perenne*, L., were found. The latter grows very rank, with showy blue flowers, often more than an inch in diameter. The seed-vessels were observed later in the season and were found to be nearly as large as in the cultivated flax (*L. usitatissimum*, L.), with seeds about half as large, of a shining dark brown color, and apparently containing a considerable proportion of oil. The question arises, whether this wild flax could be improved by cultivation so as to equal in fiber, if not in oil, the *L. usitatissimum*. It is well worth experiment to determine these points, more especially as it is a perennial, while the cultivated flax is an annual.

Polygala verticillata, L., and another species, of which no published description could be found, were frequently collected west of the Missouri, extending into Montana.

As might be expected, the *Leguminosæ* were well represented, but a lack of authorities and published descriptions prevented full and complete determinations of the many interesting species collected. Fourteen species of *Astragalus* were observed, among them *A. simplicifolius*, Gray, and *A. triflorus*, Gray. The former was observed only in Montana, on the hills between McClennan and Hodges stations on the Northern Pacific Railroad. *Psoralea argophylla*, Pursh, *P. esculenta* Pursh, and *P. lanceolata*, Pursh, were noted. The latter possesses the peculiarity of forming at

maturity a perfect joint on the stem near the ground. A light wind will then cause the plant to break off and go rolling along in the same manner as happens with *Amarantus albus*, L. (commonly called "tumble-weed"), on the prairies of Minnesota. *Psoralea argophylla* and *esculenta* also break off near the ground, but do not appear to form a distinct joint. The separation in these species is effected by means of a constriction on the stem, which cuts off, as it were, the nourishment from the root, and causes the stock to shrivel at that point, when the least touch or gust of wind releases the plant. On the hills near Mandan, and in no other place along the route, *Petalostemon macrostachyus*, Torr., was collected. Here also *P. villosus*, Nutt., was quite abundant. *Amorpha fruticosa*, L., and *A. canescens*, Nutt, were both well represented, but a little farther westward they were largely replaced by *A. microphylla*, Pursh. *Oxytropis*, *Desmodium*, *Vicia*, *Lathyrus* and *Hosackia* were found in abundance throughout the territory. *Lupinus perennis*, L., was met in the valley of the Green river; also an apparently undescribed species of this genus was collected.

Eleven species of *Potentilla* were collected, among them *P. Pennsylvanica*, L, and *P. fruticosa*, L., the latter nowhere except in Pyramid Park. Only one species of *Prunus* was seen west of the Missouri river, namely, *P. pumila*, L. Growing abundantly on the rocky buttes was *Chamærhodos erecta*, Bunge. So far as I know, this plant has not before been referred to this region. Our most common species of strawberry (*Fragaria Virginiana*, Duchesne) abounds east of the Missouri, but is very infrequent farther west. The hot dry weather prevailing during June and July doubtless proves unsuitable for its growth.

A gooseberry (*Ribes*) near *R. Cynosbati*, L., of a low bushy form, thickly armed with long stout prickles, grows on the summit of the dry baked clay hills of Western Dakota and Eastern Montana. Although growing in these extremely dry localities, it was heavily loaded in the month of July with large ripe juicy fruit, possessing a sweet and agreeable taste. Aside from scattered patches of *Shepherdia*, this was the only native edible wild fruit that was observed along the route after crossing the Missouri.

Hippuris vulgaris, L., rare in Minnesota, is plentiful in every little stream west of the Missouri, provided it is not alkaline and contains water sufficient to prevent complete evaporation during the dry season.

Of the *Onagraceæ*, *Epilobium palustre*, L., and *E. molle*, Torr.,

were sparingly found; more common were *Œnothera cæspitosa*, Nutt., and *Œ. albicaulis*, Nutt., the latter extending as far as to Muskoda station east of the Red river. Much more rare was *Œ. Missouriensis*, Sims. *Gaura coccinea*, Nutt., was very abundant.

Three species of *Cactaceæ*, *Mamillaria vivipara*, Haw., *Opuntia Missouriensis*, DC., and *O. Rafinesquii*, Engelm., were plentiful. *O. Missouriensis* was first observed, in going westward, on the hills around Mandan.

The *Umbelliferæ* were mostly represented by species of *Peucedanum*, *Cymopterus* and *Musenium*. Of these only one, *Peucedanum nudicaule*, Nutt., extends as far east as Minnesota.

On the Formation of Starch in Leaves.

In a recent communication to the *Arbeiten des Botanisches Institut*, in Wurtzburg (Bd. III), Prof. Sachs gives the results of his work during the past summer in connection with the above subject. The investigations were made with the object of determining the formation and disappearance of starch in the leaves of plants growing in the open, and under normal conditions of vegetation, and were carried on chiefly during the months of June, July and August on a large number of Dicotyledons from various families. Some twenty-two years ago Prof. Sachs showed that the presence of starch in chlorophyll grains could readily be detected by means of the now well-known iodine test, a modification of which was employed in these researches.

If fresh, green leaves are plunged in boiling water for ten minutes or so, certain soluble substances are extracted, but the starch and coloring matter of the chlorophyll grains remain in the still unbroken cells of the mesophyll. A short immersion in alcohol now removes the green coloring matter and certain bodies soluble in alcohol, leaving the starch behind in the colorless tissue. The presence of acids affects the degree of whiteness of the decolorized leaf; and the decolorization proceeds more rapidly in sunlight or warm alcohol than in the dark and cold. Leaves of *Tropœolum* may be rendered completely white, like writing paper, in two or three minutes.

If the decolorized leaf be now placed in a strong solution of iodine in alcohol, the presence or absence of starch may be demonstrated in a few minutes. If no starch is present, the cellular tissue simply presents the well-known yellow color; if a large quantity of starch exists in the cells, the tissue appears blue-black,

the venation appearing as a pale network in the dark ground. Paler colors result if but little starch is present at the time of the experiment.

It will readily be seen how useful the above method is for the purpose of demonstrating the absence of starch from etiolated leaves, the white portions of variegated foliage, etc , and the sequel shows that the method affords means of obtaining far more delicate results, without the trouble of a microscopic examination.

In the first place the same leaf may be found to contain very different quantities of starch at different periods of the day, or according to the weather; and secondly, the increase and decrease of the quantities of starch in a given leaf may be very rapid.

Sachs showed long ago that if a plant is placed in the dark, starch disappears from the leaves; and it has also been known for some time that if a piece of tin foil is placed on a leaf, the covered portion forms no starch although the parts exposed to light may become filled with that substance. Moreover, Kraus showed how very rapidly starch can be formed in direct sunlight.

Sachs now demonstrates on a number of plants that the starch formed in the leaves during the day may disappear completely during the night, and that the leaves shown to be full of starch in the evening may be quite empty of starch the next morning. This depends upon the temperature and health of the plant, but occurs normally during the summer in plants growing in the open. A large number of experiments are given in support of this, showing how the rapidity and completion of the process depends upon the weather.

The experimental proof is very simple. A leaf is halved longitudinally at night, after a fine sunny day, and the excised half is shown to be filled with starch by the iodine test described; the remaining half is tested early next morning, and shows at once if any material diminution has occurred during the night. A simple and obvious modification of this experiment gives an idea of the quantity of starch formed between sunrise and sunset. The half leaf tested before sunrise shows no trace of starch; the other half left on the plant during the day is found to be more and more filled with starch towards the afternoon.

Some curious results were arrived at as to the effect of growing parts on the rapidity of the emptying of the leaves; some of these matters still require investigation.

Differences in the weight of the leaves and in the intensity of the color produced by the iodine test, as well as some other observations, lead to a better understanding of a fact already known

generally, viz., that the starch disappears from the leaves in the form of glucoses, which travel by way of the vascular bundles into the stems, and thus pass to the places where they are used up in growth.

Some very telling observations were made in this connection, and the dependence of the processes on temperature again show forth clearly.

These results lead to the conclusion that the process of metamorphosis into glucoses and translocation of the products of assimilation are also going on during daylight, though they are less evident, because more starch is then being formed and accumulated than is abstracted at the time. Moll proved that such is the case by exposing leaves to the sunlight, but in an atmosphere devoid of carbon dioxide, the starch already in the leaves disappeared and no more was formed to replace it. Sachs repeated Moll's experiment, and proved the correctness of his conclusions by means of the iodine test. Half leaves were shown to be full of starch; the companion halves were put into closed atmospheres, deprived of carbon dioxide by means of potassium hydrate, and were exposed to sunlight. In an hour the latter halves were tested and found to be nearly emptied of starch. Other experiments proved that depletion occurred in a few hours, the time depending on the temperature.

Further experiments demonstrate that the starch travels in the form of glucoses in all the above cases, but it is not proved whether the metamorphosis is effected by forces in the chlorophyll grains themselves or by means of diastatic ferments in the cells of the leaf.

Perhaps the most ingenious part of the paper is that which now follows. It is well known that Weber's patient and thorough researches on the energy of assimilation led to two important results among others: (1) that the quantity of starch formed by a certain area of leaf surface in a certain time may be relatively very large, and (2) that different plants probably differ specifically as to the quantity of starch formed in their leaves.

Sachs proposes to apply his method to the solution of this question, i. e., how much starch is produced in, say one square meter of leaf surface by assimilation during, say ten hours of bright sunlight? The great difficulties in Weber's researches were connected with the enormous labor necessary to measure the leaf surface accurately.

Sachs resolved the matter in a manner which we may summarize thus: He cut off portions of large leaves found to be

empty of starch, measured them rapidly by laying them on pieces of board cut to the size of one square meter, and weighed the measured portions very rapidly. Certain precautions as to the area of fibro vascular bundles, the possibilities of absorbing hygroscopic moisture, etc., may here be passed over. Supposing these portions of the leaves to be estimated in the morning, a quantity of the same leaves of equal area gathered in the evening was then compared, and the increase in weight gives the quantity of starch formed in the interval. By weighing large areas, and frequently, and by paying attention to the times and other circumstances, a large number of results were obtained, showing that the quantities given by Weber, for instance, are within the mark. Of course these results are not absolute. Starch is being changed into glucose, and passing away during the day, and some must be burnt off in respiration; moreover, a certain minute quantity of mineral ash should be allowed for. Of course it is an assumption that equal areas of mesophyll of the same leaves contain approximately the same amount of substance; nevertheless, if a large number of experiments are made, the error is probably small.

Experiments were made to show both the quantity of starch which disappears during the day and the quantity which is formed during the day. A few of the numbers may be given. In *Helianthus*, 9.64 grms. of starch disappeared in ten hours from one square meter of leaf-surface.

In the same plant 9.14 grms. were formed in the same time by the same area of leaf-surface.

In another case *Helianthus* was used, but the leaves were removed from the stem to prevent the passage back of the starch from the mesophyll into the stems.

A square meter was found to produce starch at the rate of 1.648 grms. per hour.

By combining his experimental results and taking note of all the circumstances, Sachs concludes that 20 to 25 grms. of starch may be produced per day by one square meter of leaf-surface as an ordinary occurrence, and these numbers are not only not excessive, but experiments show that there are plants which produce much more than those investigated here.

Some remarkably interesting and important results follow from the consideration of these experimental data.

They explain why plants are so vigorous during warm nights following upon hot, bright days. The more readily the products of assimilation (formed in large quantities during the day) can pass into the growing organs, the better these are nourished, etc.

Leaves used as fodder, etc., must differ in nutritive value to a very great extent if their starchy contents vary so largely during the day and night; it thus becomes of primary importance whether such leaves are gathered in the morning or the evening, in cold or warm weather, etc. The same applies to *tobacco* and *tea*, etc. It must make a vast difference to the smoker whether his tobacco abounds in carbohydrates or is relatively richer in the alkaloids. It appears that tobacco is habitually cropped in the morning in some countries, a fact which suggests what experience has already shown that a difference in the quality exists; it will be interesting to inquire further into these matters.

Sachs' results will also materially affect the physiological value of the analysis of leaves. Some of us know how great are the variations met with in the analysis of the ash contents of leaves of the same plant. It is clear that in addition to the age of the leaf, the soil, manure, etc., it is important to know the amount of starch present. It can not but happen that the mineral matters ebb and flow as well as the starch. The analysis of leaves will also be more valuable for the purposes of physiology if the numbers are stated not in simple percentages, but in terms of one square meter of leaf-surface.

The above brief summary of the results obtained by Prof. Sachs by no means does justice to the beauty of his methods, and the masterly way in which they are carried out; it must be admitted by all who understand the value and importance of this work that it is worthy of the great pioneer of vegetable physiology. Moreover, it suggests several matters which require further investigation, and no doubt would yield valuable results to those fortunate enough to have a botanical garden at hand.—*H. Marshall Ward, in Nature, XXIX., 554.*

GENERAL NOTES.

Necrology.—AUGUSTUS FENDLER died on the island of Trinidad, November 27, 1883, at the age of seventy-one. This we learn only at the present date, by a memorandum which was found on the table of the lamented Dr. Engelmann who was so soon to follow him. Fendler was born in Eastern Prussia, somewhere near Königsberg, received a good ordinary education, came to this country not far from the year 1840, was selected by Dr. Engelmann and the present writer to make a botanical collection in the northern part of New Mexico on the occasion of the movement of the United States troops to Santa Fé in 1846. Afterwards (1856–7) he, with a younger brother, migrated to Tovar, a German

settlement in the mountains of Venezuela, where he made a large collection of dried plants, and later a small one on the Isthmus. He then returned to his native country, but after a year or two his longing for botanical exploration and for a milder climate took him to Trinidad, where for a time he botanized with his old zeal and assiduity.

Fendler was a close and accurate observer, a capital collector and specimen-maker, very pains-taking and methodical, and his excellent distributed collections are classical, especially the first one, a large part of which was early named and published in the *Plantæ Fendlerianæ Novo-Mexicanæ*. It was the first collection made in that part of the country. He is commemorated in a beautiful and quite peculiar Saxifragaceous shrub, indigenous to New Mexico and Texas, *Fendlera rupicola*, and numerous species of his own discovery bear his name. He was very retiring and shy in habits, of refined bearing, and of a scientific turn of mind in other lines than that of his chosen pursuit of Botany. He kept up meteorological observations during most of his life, and he was very much interested in speculative physics. In the year 1874 he published at Wilmington, Delaware, where he then resided, at his own expense and, we suppose, with small returns, a well-written treatise (of 154 pages, 8vo.) on "The Mechanism of the Universe and its primary effort-exerting Powers; the Nature of Forces and the Constitution of Matter, with remarks on the Essence and Attributes of the All-Intelligent." He was one of the ingenious race of paradoxers, and it may be left to the future De Morgan to characterize his work. He will certainly be lastingly and well remembered in botany.

Alphonse Lavallée, as we are grieved to learn, died at Segrez, his country seat, a few leagues from Paris, on the third of May last, at the age of only about forty-nine. This is a most unexpected and a heavy loss to botany, and especially to dendrology. A gentleman of abundant means and of great public spirit, he had taken ornamental trees and shrubs for his specialty, had formed nearly the largest and best collection of these in Europe, and had devoted himself to their study with utmost assiduity, endeavoring to determine them correctly, to ascertain their history, and to settle their synonymy. His first publication upon the *Arboretum Segrezianum* was his Enumération des Arbres et Arbriseaux cultivés à Segrez, an 8vo. vol. published in 1877, in which much attention is paid to the synonymy. In 1880 he began his fine illustrated work, the *Icones Selectæ Arborum et Fruticum in Hortis Segrezianis collectorum*, in imperial quarto, of which he had brought out five parts, the last in December, 1882, with thirty plates; and early in the present year he published, in the same sumptuous form and with great beauty of illustration, *Les Clematites à Grand Fleurs*, with twenty-two plates. He had in preparation a general monograph of *Crataegus*, to be illustrated by eighty plates. Very recent letters spoke of some failure of health, and of a visit made to Cannes for its benefit, also mentioning that he had been pressed to take the chair of culture at the Paris Museum, which carries with it the superintendence of the *Jardin des Plantes*, vacated by the death of Decaisne, but was obliged to decline it. A serious loss, indeed, is sustained in the death, at middle age, of this zealous collector of our science, this most liberal-minded, amiable, and accomplished man. A. G.

Helonias bullata in Northern New Jersey.—While botanizing in low grounds bordering on Budd's Lake, Morris county, last year, I discovered several clusters of *Helonias bullata* bearing scapes of faded flowers; owing to lack of time I was unable to see to what extent it was established. I again visited the same locality this year, and after further search I found growing in a piece of woodland several acres in extent, a great abundance of these plants, many of them in fine flowering condition. There can be no possible doubt that *Helonias bullata* has been well established for years in this locality. It has been collected in various portions of Southern New Jersey, its range extending as far north as Freehold, Monmouth county; the only other habitat north of this being at Succasunna, Morris county. I am therefore pleased to be able to make an important addition to the habitats of what appears to be the most northern limit of this plant in New Jersey.—EUGENE A. RAU, *Bethlehem, Pa.*

Abnormal Trillium.—An abnormal specimen of *Trillium erectum* was collected near here a few days ago. It had the regular whorl of three leaves, and at the peduncle, about half way between the leaves and the flower, was a fourth and a smaller leaf. The flower itself was four-parted throughout. There were four sepals, four petals, eight stamens, four pistils, and a four-celled ovary. Two of the sepals were half green and had the other halves colored like the petals.—JOS. F. JAMES.

Note on Viola cucullata.—The flowers of *Viola cucullata* have been remarkable this spring for their numbers and size. Banks are literally blue with them, and many are an inch in diameter. But what is stranger is that they are being largely visited by bees, and are setting fruit freely. Heretofore the fruit has been difficult to find, but it is not so this year. Probably the size of the flowers is the cause of the visits of the bees, and the visits the reason for the setting of the fruit. A curious variation of color was also noticed. The flowers were of a light lavender, not a deeper color faded out, because there were too many of them, and others close by and under the same condition were of the deepest blue. —JOS. F. JAMES.

Arisæma polymorphum, Chapman.—When in North Carolina a few summers ago, I kept a lookout for *Arisæma polymorphum*, but found only a single very small plant of something I thought might be it, and brought it home to my garden. This season it has become strong enough to flower. I have little doubt it is the plant intended under the above name. But while Chapman describes the species as with "leaf solitary," mine has two leaves, as Gray describes *A. triphyllum* "mostly" to have. One of these, the weaker, is simply trifoliate, the other is nearly but not quite quinate, the two lateral lobes being very deeply divided, forming two large auricles towards the base. The spathe is of a very pale green, and with the spadix smaller than the form common in our woods. It is in bloom to-day, June 1st. Our wild plant was in bloom full a month ago. Believing the two to be distinct I have been to the woods for a quantity for comparison, and find all the flowers apparently a couple of weeks over bloom, and all faded, so that I can not find a single one on the road to fertility. Now these leaves are all cinereous on the under sur-

face, while the North Carolina one is pale green on both sides. So far there seemed to be some ground for distinction, but on looking about in the woods I found several in which one of the three leaflets was partly divided. In one case the division extended two-thirds of the distance towards the midrib. Still the gray under surface seemed uniform through all these wild plants. I was surprised to find all of them barren, and went to a locality where I knew I had collected ripe fruit, and found these plants quite different from the early ones. They were larger and stouter, purple stemmed, with two leaves on a stalk as in he North Carolina one, the leaves pale green on both sides, as in the North Carolina one, and just opening its flowers, also as in the one from North Carolina. I did not know before that there were early and late flowering ones with us; that the early ones had gray under surfaces, and that the early ones were barren. It will be interesting to know whether this holds good in other localities. But I suppose we shall have to consider *A. polymorphum* as merely *A. triphyllum*, without even honoring it with a varietal name.

By the way, Engler, in De Candole's monograph, adopts Schott's name, *Arisæma quinatum* for this *A. polymorphum*, and Blume's name, *Arisæma atrorubens*, for our *A. triphyllum* and varieties.—THOMAS MEEHAN.

EDITORIAL NOTES.

THE PHILADELPHIA MEETING promises to be an unusually important gathering for botanists.

ABOUT TWENTY BOTANICAL NOTES are found in the first part of the *Proc. Philad. Acad.* for 1884, principally by Mr. Thos. Meehan.

IN THE GAZETTE for April, p. 53, 54, *Antirrhinum Nevinianum* was by a clerical mistake given as *A. Nivenianum*. It should be corrected accordingly.

THE SUMMER COURSE IN BOTANY at Cambridge this year will be under the charge of Prof Wm. Trelease. It begins July 7th and lasts six weeks, and among advanced students special attention will be given to the study of Cryptogams.

THE WHOLE EDITION of the translation of Nägeli and Schwendener's work on the microscope, about to be published by a London firm, was recently destroyed by fire. It will again be put through the press, however, with as little delay as possible. This is the most important work for botanists on microscopic manipulation yet issued in our language.

A SOCIETY for the protection of alpine plants has been formed at Geneva. "L'association pour la protection des plantes" is its title, and already it numbers about two hundred members. The means used are to spread a knowledge of the danger by means of correspondence and publications; to post placards in Swiss hotels; to cultivate for sale such alpine plants as can be grown in the valleys, and thus furnish them already potted for transportation.

As an instance of polymorphic species *Euphrasia officinalis*, L., might be mentioned. Mr. Frederick Townsend, in a recent number of the *Journal of Botany*, has grouped the many forms, naming fourteen groups, and preparing an analytical key which looks formidable enough for a large genus.

Mr. Meehan has published quite a sizeable catalogue, with notes, of the plants he collected in July, 1883, during an excursion along the Pacific coast in S. E. Alaska. He enumerates about two hundred and sixty species and the local notes with regard to occurrence, native names and uses are very interesting.

The method of sectioning diatoms practiced by Prof. W. J. Sollas, of England, and communicated by him to the Royal Microscopical Society, is to harden in a mixture of chromic acid, osmic acid, and absolute alcohol, stain with hæmatoxylin or eosin, and then cut by freezing in gelatine jelly, from which the sections are directly mounted in glycerine without passing through water. He hopes by this means to obtain a clear insight into the protoplasmic structure.

It is pleasant to note the interest taken in fungi in England. We have now to announce a manual covering the British Discomycetes, with illustrations of the genera, by William Phillips, F. L. S. The author's special knowledge and excellent facilities warrant us in anticipating a thoroughly good work. The price will not exceed $2.50, and a liberal subscription will reduce it. Address the author at Canonbury, Shrewsbury, England.

The fossil flora of Greenland now numbers 617 species, according to Prof. Heer's recent studies, distributed through the Cretaceous and Tertiary epochs. Only one dicotyledonous plant is known from the lowest beds, and the character of the vegetation shows the climate at that time to have been subtropical. A slow change took place until in the Lower Miocene no tropical forms remained, and the mean yearly temperature fell to about 53° F.

Switzerland has a society to prevent the extermination of wild plants, and England has introduced a bill in the House of Commons looking to the same end. In this country we have only a few local laws for this purpose, but we agree with *Science* that at present the danger of valuable kinds becoming extinct is very slight. Some are likely to become rare in certain localities, however, so that protective laws applicable to restricted districts would be desirable in special cases.

During the first two days of the Association at Philadelphia, botanists will find the registry book of the American Botanical Club at the Academy of Natural Sciences, and upon entering their names will become members of the club, and entitled to its privileges. A reception will be given the club on Monday evening, September 8, by the Botanical Section of the Philadelphia Academy of Sciences at the rooms of the Academy, it being the date of their regular monthly meeting.

At a February meeting of the Linnean Society of London, Mr. R. Miller Christy read a paper entitled "The power of penetrating the skins of animals

possessed by the seed of *Stipa spartea*." The fact is well known that the seeds of *Spartea* are driven into the soil by means of a very sharp point and the power of hydroscopic movement possessed by the long bent and twisted awn. It also appears that animals, especially woolly animals, sometimes have their skins penetrated by these same seeds, but there is no evidence that they are directly a cause of death. Mr. Christy was of the opinion that this was a device to secure the dispersion of this seed (one of the "buffalo grasses") by means of the buffalo. But the opinion seemed to prevail in the Society that it was simply a contrivance for penetrating the ground, which is the common view in regard to it in this country.

THERE HAS NEVER been greater activity in the study of bacteria than at the present time. Among notable works lately issued are *Les organismes vivants de l'atmosphère*, by Miquel, *Bacteria*, by Magnin and Sternberg, both by authoritive bacteriologists, and the life of Pasteur, giving the methods of the great leader, of which an English translation will soon be issued by the Appletons. Among the recent announcements are the detection of the bacteria of yellow fever, by Dr. Domingos Freire, of Rio de Janeiro; the communication to the French Academy by M. Pasteur, that he is able to inoculate dogs and render them proof against madness; the accomplishment of what the German commission under Koch has yet failed to do, the transmission of cholera to the lower animals by Dr. Vincent Richards, of Calcutta, who experimented with pigs; and the discovery that flowing water retards bacterial development, by Dr. Pehl, of St. Petersburg.

A NEW WORK on British *Hymenomycetes* (mushrooms, toadstools, etc.) is to be published as soon as the subscription list will warrant the expense. Whoever has attempted the collection and naming of these plants has met with the great need of fuller and more exact descriptions, a need the present work is intended to supply. It is to embody translations from Fries' *Monographia*, a work so rare as to be practically inaccessible, as well as from the *Hymenomycetes Europæi*, the *Epicrisis*, and the *Icones* of the same author. The rare classical scholarship of the eminent mycologist who has undertaken the work, the Rev. John Stevenson, assures us of the faithful rendering of the Latin text; while the assistance of several well known botanists who are elsewise to co-operate with the author, and the numerous illustrations by Worthington G. Smith, will together place the work among those indispensable to every amateur or professional botanist who gives attention to this group of plants. The fungologists of this country should not be tardy in encouraging so promising a work. It will be published in two octavo volumes at 10s. 6d. each. Subscriptions are to be sent to Rev. John Stevenson, Glamis, Forfarshire, N. B., Scotland.